Environmental Studies Program: Ongoing Study

Study Area(s): GOM Central Planning Area

Administered By: Gulf of Mexico OCS Region

Title: GM-14-03-07: Investigation of an Ancient Bald Cypress Forest in the Northern Gulf of Mexico, USA

BOEM Information Need(s) to be Addressed: BOEM devotes considerable resources to carrying out its mission to identify and preserve the nation's natural and cultural resources as per the National Historic Preservation Act (NHPA) of 1966 and the National Environmental Policy Act of 1969. However, there is a gap in understanding how the presence of preserved landscapes such as drowned forests and marshlands, which contain valuable information of past ecosystems, climate, and physical geology/geography, fits within this realm and how the geological and geophysical characteristics of these drowned terrestrial habitats interplay with BOEM's outer continental shelf (OCS) management needs and objectives. By placing the drowned Cypress forest site within the sedimentological context of the GOM, this research will (1) determine the preservation characteristics of the site, (2) provide a better understanding of depositional and geomorphic layout of the site, and (3) provide the opportunity to develop a model to predict other paleoforest sites within the GOM. This information may subsequently be used by BOEM to: (1) develop more effective survey methods for detecting and characterizing such seabed features, and (2) determine if environmental impact statements are necessary for such sites when relevant to proposed oil, gas, and dredging activities.

Total Cost: (in thousands) $262 **Period of Performance:** FY 2015-2018

Conducting Organization(s): Coastal Marine Institute, Louisiana State University

Principal Investigator(s): Kristine DeLong (kelong@lsu.edu)

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Description:
Background: In late 2004, a local fisherman found a spot with abundant fish south of Orange Beach, Alabama after Hurricane Ivan made landfall near Gulf Shores, Alabama on September 16, 2004. Subsequent surveys found a 2.2 m depression in flat seafloor bottom characterize by sand and clay sediments. Scuba surveys in 2013 found the depression contained layers of gray clay sediments with well-preserved woody remnants and several stumps exposed or partially exposed. Well-preserved wood has been found in anoxic peat bogs in freshwater environments, where anoxic sediments limit biological organisms and decomposition, but wood is rarely preserved in marine environments. This unique site and study will yield valuable information of Gulf Coast coastal geomorphology, sediments that preserve macrobotanicals, and glacial environmental and climate dynamics.

Objectives: The primary objective of this project is to document and characterize an area in the northern Gulf of Mexico off the coast of Alabama that contains well-preserved ancient bald cypress stumps in order to generate information on the geological, geophysical, ecological, and paleoenvironmental characteristics of this geographical site type.

Methods: The following methods/tasks are currently in use, underway, or planned for this study: (1) Use high-resolution swath bathymetry, side scan sonar, and CHIRP subbottom profiler to delineate the spatial extent of the site and to resolve the position of tree stumps; (2) Ground-truth geophysical survey targets with scuba survey;(3) Investigate the presence/absence of marine boring organisms/scars within in situ stumps and logs; (4) Conduct dendrochronological analysis of the tree stumps; (5) Collect push core and vibracore sediment samples across the site; (6) Use established dating methods to compare the age of sediments, and the subsequent sedimentation rate to calculate the age of the in situ tree stumps; (7) Examine microfossils (including foraminifera, diatoms, etc.) in the sediments for shifts between terrestrial/freshwater species and marine species; (8) Determine the organic content of local sediment through pollen analysis; (9) Develop a model to predict other buried forest sites in the GOM; and (10) Place the forest landscape in the context of northern GOM shelf evolution with changes in sea level.

Current Status: The project for years one and two accomplished all of the main goals for these year including two field seasons that collected geophysical data (side scan sonar, subbottom profiler, swath bathymetry, and magnetometer) and recovered 18 cores for a total of 43.24 m of sediments. The two fieldwork excursions allowed the team to establish the geophysical methods for surveys and attempt to identify the trees exposed and buried in the sediments using these tools. The geophysical surveys allowed the team to characterize the area surrounding the exposed trees to better understand the geomorphological setting of the ancient forest and allowed the team to propose a working hypothesis for how the trees were buried and preserved. Laboratory work included scanning the cores for imagery and sediment density, characterizing the sediments and organic content, radiocarbon and optical spectral luminescence (OSL) dating of organic content and sediment samples, and conducting pollen and microfossil analysis. Data synthesis and analysis is essentially complete and the project team is drafting the final report.

Final Report Due: September 30, 2018

Publications Completed:

Gonzalez, S., S. J. Bentley, Sr., K. L. DeLong, K. Xu, J. Obelcz, J. Truong, G. L. Harley, C. A. Reese, and A. Caporaso, 2017, Facies reconstruction of a late Pleistocene cypress forest discovered on the northern Gulf of Mexico continental shelf: Gulf Coast Association of Geological Societies Transactions, v. 67, p. 133–146.

Affiliated WWW Sites: Coastal Marine Institute, Louisiana State University: http://www.cmi.lsu.edu/index.html

https://marinecadastre.gov/espis/#/search/study/100147

Revised Date: February 20, 2018